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THE WILLOW OAK.

BY HENRY TRIMBLE.

One of the most interesting of the oaks in this vicinity is the *Quercus Phellos*, L., or willow oak. While it is not of great value from an economic standpoint, it nevertheless affords the means of profitable study by the botanist. The casual observer, if he did not notice the tiny acorns, would pronounce it a willow tree, and its resemblance to the latter, especially in the matter of foliage, is very striking. It has, therefore, always been regarded with curiosity, and judging from the correspondence of Peter Collinson and John Bartram, it is evident, from the appeals of the former for specimens, that it was especially a botanical curiosity in London over a century ago.

About thirty-five years ago the late Professor Procter visited, with S. B. Buckley, a grove of willow oaks near Mount Holly, N. J., for the purpose of identifying one among them which showed some variations in foliage. Mr. Buckley contributed a paper on this oak to the Academy of Natural Sciences and published it with additions in the AMERICAN JOURNAL OF PHARMACY, for March, 1862. Evidently these two men decided that the peculiar member of the group was Bartram's oak, *Quercus heterophylla*, Michx., and that it was merely a variety of the willow oak and not a hybrid. It may be said that this opinion is held by many at the present day, although, according to Sargent, it is a hybrid of the willow oak with *Quercus velutina*, and Britton and Brown state that it is probably a hybrid of the

willow oak with *Q. rubra*. Gray gives the combination as *Q. Phellos* with *Q. rubra* or *coccinea*.

Some pertinent remarks on "Hybrids in Nature," by Thomas Meehan, have recently appeared in the *Proceedings of the Academy of Natural Sciences of Philadelphia* (1897, p. 194), in which, using the oaks as an illustration, he shows that hybridization will not account for the variations in this genus.

The willow oak is found along the coast of the Eastern United States, from Long Island, New York, southward to Florida, and thence westward to Missouri and Texas. It prefers low, moist ground, and is quite common in the lowlands on both sides of the Delaware River, south of Philadelphia. It has also become more common of late years by cultivation as an ornamental tree.

In this latitude it is a rather small tree, rarely exceeding a height of 40 to 50 feet, but further south it attains a maximum of 80 feet, and a diameter of 3 feet.

The accompanying illustration shows the peculiar character of the foliage, which is rather densely crowded at the ends of the branches. Nearly all the illustrations of the acorns which are figured in books on the subject are far from being true representations. Sargent's "North American Silva" is, however, a notable exception in this respect. In the present instance the illustration, being a photographic reproduction, differs from the natural object only by a slight reduction in size.

As stated at the beginning of this paper, the willow oak has not attained any great economic value, and most writers give it a poor name. No less an authority, however, than Dr. Charles Mohr, of Mobile, Ala., says the wood is hard, very elastic, compact, and suitable for railway carriages and many other purposes.

It is hoped that, ere long, something will be forthcoming from the Chemical Laboratory of the College, on the composition of the bark, which has been under investigation for some time. So far as the tannin is concerned, the bark does not appear to be sufficiently rich to warrant its use in the manufacture of leather.

For the photograph from which the illustration was made I am indebted to my friend, Dr. Charles Schäffer.

LABORATORY NOTES.

BY CHARLES H. LAWALL.

The question of stability in pharmaceutical preparations is one which has received comparatively little consideration. A process for making a tincture or a fluid extract is considered satisfactory when little or no precipitation takes place after standing for some time.

The methods for alkaloidal assaying, which are in use at the present time, are of such recent origin that very few data have been recorded as to the stability of such preparations as may be assayed.

In a few years such facts as these will have been published and a better knowledge will have been obtained regarding the character of the precipitate which forms in many fluid extracts and tinctures.

In the case of fluid extract of ipecac, the author has an opportunity of recording the alkaloidal assay of a sample which was made by the late Prof. John M. Maisch while he was in charge of the Government hospital laboratories during the Rebellion.

No knowledge can be obtained as to the alkaloidal strength of the preparation as originally made, or the quality of the drug which was used in manufacturing it; but, in view of the fact that it assays considerably above the standard after a lapse of more than thirty years, it is safe to conclude that fluid extract of ipecac, as made by the process in use at that time, is a stable preparation.

The process described in the 1860 Pharmacopœia, by which this preparation was no doubt made, is essentially as follows:

Sixteen troy ounces of powdered ipecac are exhausted by percolation with alcohol, and the alcohol is distilled off until a syrupy liquid remains; this is mixed with 1 fluid ounce of acetic acid and 10 fluid ounces of water, and boiled gently until it is reduced to 8 fluid ounces (this separates resinous matter); the liquid is then filtered and made up to 8 fluid ounces in volume by the addition of water, after which it is mixed with 8 fluid ounces of alcohol.

In the 1890 Pharmacopœia the process is very different. 1,000 grammes of powdered ipecac are percolated with a menstruum consisting of 3 parts of alcohol to 1 part of water; 1,000 c.c. of fluid extract are made. This is a different drug strength in the finished preparation. The 1860 preparation has about 1,055 grammes of drug to each 1,000 c.c., the alcoholic strengths of the menstrua differ, and the present official process dispenses with the

acetic acid, as formerly used. These differences indicate that it would not be wise to conclude that a preparation made by the present official process would keep as well as the one recorded here.

The preparation is of undoubted authenticity, and was obtained through the kindness of Mr. Frederick Sher, of the Smith, Kline & French Company, in whose possession it has been for many years.

It bears a label stating that it was "prepared at the U. S. A. Laboratory, Philadelphia, Pa., 1864." The bottle has the words: "U. S. A. Hosp. Dept.," blown in the glass, which is of a very deep blue color. The bottle had been so carefully sealed that no apparent evaporation of the liquid had taken place when it was received by the author. It has a pleasant acetic odor and strong characteristic taste, and the sides of the bottle are covered with a resinous deposit, the quantity of which could not be determined.

For the assay, a sample was carefully decanted so as to avoid transferring any precipitate which might contain the alkaloids. The process of Keller was followed, titrating the varnish-like residue by means of decinormal sulphuric acid and centinormal potassium hydrate, using hæmatoxylin as indicator. The alkaloidal strength was 2.76 per cent., calculated as emetine. As 2.00 per cent. is the present standard adopted by manufacturers who assay this preparation, it has lost little or no alkaloid after a period of thirty-three years. It speaks well for the quality of the drug, and the thoroughness of the manipulation used, and would compare favorably with our present day products, made by so-called improved apparatus and perfected methods.

Japan Wax.—In the AMERICAN JOURNAL OF PHARMACY for January, 1897, the author published an article on the extensive adulteration of Japan wax with starch. Since that time more than 300 cases of Japan wax (aggregating 60,000 pounds) have been examined, all of which complied with the requirements of a normal product. The melting point ranged from 50° to 54° C.; the specific gravity from 0.965 to 0.984; the acid number from 17.98 to 20.45, and the saponification value from 217.93 to 224.86.

In physical characters there was a slight variation; some of the samples seemed to be more greasy than others, this being noticeable either by pressing the wax between the fingers or by masticating a small portion. Such a slight difference, however, might be

due to variations in the age of the product or in the methods of preparing it for the market.

Mercurial Ointment.—A number of samples of mercurial ointment, made by reputable manufacturers, were examined. The percentage of metallic mercury was found, in every case, to approximately agree with the amount claimed upon the label.

Calcium Phosphate Precipitated.—Several large consignments of this substance were found to contain a great quantity of carbonates. In one case the amount of calcium carbonate present reached 40 per cent.

The use of such a product in the manufacture of tincture of opium by the formula in the 1890 Pharmacopœia would result in the retention of the morphine and the consequent worthlessness of the preparation. An unsuspecting druggist, using it in this manner, might render himself liable to prosecution for dispensing tincture of opium below the legal standard, or the dispensing of such an inert preparation upon a prescription might contribute to the death of a patient.

The occurrence of such products, which eventually find their way into the market, emphasizes the necessity for that personal examination of goods which it is the duty of each druggist to make. Honest manufacturers have nothing to fear from this, while those who are in the habit of furnishing inferior goods would either be compelled to raise their standard or go out of business.

Beeswax.—The record of the samples of beeswax examined during the present year was very unfavorable, notwithstanding the number of reputable dealers who are interested in the purification and sale of this product.

Sixteen (16) samples were examined. Of these but seven (7) answered all of the requirements of a pure wax; five (5) contained small quantities of stearic acid, indicated by an acid number of about 25.00 and verified by Fehling's test; one (1) contained a larger amount of stearic acid (acid number, 46.92), and three (3) contained paraffin in varying quantities, the acid numbers ranging from 4.53 to 12.55.

Those samples which contained paraffin were of a suspicious appearance and feel, but the presence of such small quantities of stearic acid as indicated by an acid number of 25, does not materially alter the appearance of the wax, while it totally unfits it for

some purposes, among which may be mentioned its use in lithographic work.

Such a slight contamination should be looked upon as accidental, rather than wilful adulteration, and those who buy the wax from the producer should carefully examine it before refining, as it is possible for it to have its origin in a manner which is very well known to those who are acquainted with the details of apiculture, namely, in the use of artificial comb foundation, which is purchased by many bee-keepers to save part of the labor of the colony and insure regularity in the building of the comb.

Contaminations originating in this manner are frequent, and the blame rests upon the manufacturer of the artificial comb foundation.

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THE YELLOW COLORING PRINCIPLES OF VARIOUS TANNIN MATTERS.¹

BY A. G. PERKIN.

The author continues his investigation of tanning materials, with the object of studying the yellow coloring principle which is so often found associated with the tannin in plants, and also for the purpose of determining the relationship between the coloring matter and tannin, by the character of their decomposition products.

Cape sumach, *Colpoon compressum*, was first examined. The leaves (which constitute the part utilized), roughly broken, were extracted in a Soxhlet's apparatus, first with ether to remove wax and chlorophyll, and then with alcohol, which dissolved both coloring matter and tannin. The alcoholic extract, after being evaporated to a small bulk, was poured into water, and the mixture extracted with ether. The aqueous liquid was freed from the small amount of alcohol remaining by distillation, and on cooling became semi-solid, owing to the production of crystals. These were collected and washed with ether, chloroform, and dilute alcohol until the washings were colorless. The yellow product obtained was further purified by crystallizations from dilute alcohol and a final crystallization from boiling water.

Experiments showed this substance to be a glucoside, which, on decomposition with dilute sulphuric acid, yielded a yellow coloring

¹ Abstracted from the *Journal of the Chemical Society*, London, October, 1897.

principle as one of the products. The acetyl derivative of this crystallized from alcohol in colorless needles melting at 189° to 191° . By fusion with alkali two crystalline decomposition products, namely, phloroglucinol and protocatechuic acid, were obtained. These properties, together with an examination of its dyeing and other properties, clearly showed the coloring principle resulting from the decomposition of the foregoing glucoside to be quercetin.

To ascertain the nature of the sugar liberated in the above action, the osazone derivative was prepared. This consisted of glistening yellow needles melting at 205° , and was apparently *dextrosanone*.

Of the three distinct glucosides of quercetin which have been described, the one under consideration was found to resemble viola-quercitrin, in that it yielded quercetin and glucose on decomposition. The author proved, however, that they were not identical, and proposed to name the substance obtained by him *Osyritin* from *Osyris compressa*, another name for Cape sumach.

The tannin obtained from the filtrate, from which the osyritin had been separated, was examined to determine its general characters. It was found to be a tannin glucoside, and to closely resemble quino-tannic acid and quinovatannic acid, which are decomposed by acid into a sugar and an anhydride, and yield protocatechuic acid on fusion with alkali.

A study was made of the coloring principles of the two varieties of commercial catechu, namely, gambier and acacia catechus. The identity of the coloring principle of the former variety with quercetin, as reported by Löwe (*Zeit. anal. Chem.*, 1874, 12, 127), was confirmed, and while the properties of the principle from the latter variety indicated that it was also identical, it was not obtained in sufficient quantity for ultimate analysis, 400 grammes of catechu yielding only 0.05 grammes of coloring matter.

Rhus cotinus, the Venetian variety of sumach, next received attention, and the coloring principle, determined to be myricetin instead of quercetin, as reported by Löwe. It yielded, with dilute alkalis, a deep green solution, and its acetyl derivative crystallized in colorless needles, melting at 203° – 204° . Owing to the excessive adulteration which is practised with this product, the author does not consider his results in this case as final, but, nevertheless, regards them as extremely suggestive.

Of other tannin matters, the following fruits and seeds were ex-

amed : "Valonia," the acorn of *Quercus ægilops*; "Dividivi," the seed pods of *Cæsalpinia coriaria*; "Myrabolans," the unripe fruit of *Terminalia chebula*; "Algarobilla," the seed pods of *Cæsalpinia brevifolia*; pomegranate rind, *Punica granatum*; and gall nuts, *Quercus infectoria*. An exhaustive investigation of these products by numerous methods showed that they contained no member of the quercetin or allied series, but all were found to depend, either directly or indirectly, upon ellagic acid alone for their dyeing properties. They are all very similar in this respect. Experiments were made with woollen cloth mordanted with chromium, aluminum, tin and iron. For the sake of comparison, some of the results were tabulated, as follows:

	Chromium.	Aluminum.	Tin.	Iron.
Ellagic acid . . .	Pale green-olive-yellow	Pale olive-yellow	Scarcely dyed	Somewhat olive-gray-black
Valonia nuts . . .	Green-olive-yellow	Faint olive	Scarcely dyed	Weak gray-black
Pomegranate rind	Yellow-olive	Faint olive	Scarcely dyed	Weak bluish-gray-black
Gall nuts.	Green-olive	Faint olive	Scarcely dyed	Purplish-black

The following table was presented to show the intimate connection between the coloring principles and the tannin matters in the plants examined, for, on decomposition, the same acid, and, in some cases, the same phenol was obtained from both:

	Tannin.	Decomposition Products of Tannin.	Coloring Matter.	Decomposition Products of Coloring Matter.
Quebracho Colorado	Quebrachotannic acid	Phloroglucinol and protocatechuic acid	Fisetin	Resorcinol and protocatechuic acid
<i>Rhus coriaria</i> . . } <i>Rhus cotinus</i> . . }	Gallotannic acid	Gallic acid	Myricetin quercetin	Phloroglucinol and gallic acid
Gambier Catechu } Acacia Catechu }	Catechin	Phloroglucinol and protocatechuic acid	Myricetin quercetin	Phloroglucinol and protocatechuic acid
Acacia catechu . . .	Catechin	—	—	—
Colpoon compressum	A catechol tannin	Protocatechuic acid	Quercetin	Phloroglucinol and protocatechuic acid
Dividivi, etc.	Ellagitannic acid	—	Ellagic acid	—

THE VEGETATION OF THE YELLOWSTONE HOT SPRINGS.

BY JOHN W. HARSHBERGER, PH.D.

The actual discovery of the Yellowstone Wonderland, by which is meant its full and final disclosure to the world, was the work of three parties, who visited and explored it in the years 1869, 1870 and 1871. Although, since the last date, much has been written concerning the geological and physiographical features of the park set aside by Act of Congress in the year 1872, little has been written concerning the flora of the region, and what has been published deals almost entirely with the plants from a systematic standpoint.

Situated in the northwestern corner of Wyoming, in the Rocky Mountains, at an elevation ranging from 6,000 to 12,000 feet, the region is one of high and lofty mountains, of deep cañons walled in by precipitous sides, and of beautiful upland valleys, the natural haunts of the timid herbivora that seek the mountain meadows for the tender and nutritious grasses which grow there luxuriantly. The pasturage in many of the meadows and valleys is excellent, being formed by the growth of such grasses as alpine timothy, *Phleum alpinum*, blue joint, *Calamagrostis Canadensis*, sheep's fescue, *Festuca ovina*, *Koeleria*, *Koeleria cristata*. The herbaceous vegetation is not so striking as in many other regions, but still the distribution of such species as do occur is interesting. In the lakes and rivers we find the aquatic vegetation to consist of *Ranunculus aquatilis*, *Nuphar advena*, *Nuphar polycephalum*, *Utricularia vulgaris*, *Lemna trisulca*, *Typha latifolia*, *Sparganium simplex*, etc. Near the head of Yellowstone Lake is found *Subularia aquatica*, a plant of quite a remarkable distribution, found nowhere else in America except in Maine and New Hampshire. *Gentiana detonsa*, *Spraguea umbellata* are striking plants. The meadows and hillsides are spangled with bright-colored flowers, among which may be noted the bee larkspur, *Delphinium Menziesii*, the columbine, *Aquilegia flavescens*, the harebell, *Campanula*, the aconite, *Aconitum Columbianum*, the lupine, *Lupinus*, the evening primrose, *Oenothera*, the aster, the painted cup, *Castilleja*. It is a remarkable fact that scarcely a night passes throughout the summer without frost, so that the herbaceous plants grow and bloom under somewhat unusual conditions. The fringed gentian, *Gentiana detonsa*, closes its flowers as night approaches, to open them again in the morning, and many other plants provided

with a hairy or woolly covering are thus secure against frost action. The plants of the Yellowstone region, as far as observed, are well adapted to their surroundings.

The forests are formed by one tree predominating, *Pinus contorta*, var. *Murrayana*, which grows tall and straight, but never reaches any considerable girth. Interspersed among the pines we find several other arborescent species, namely, Douglass spruce, *Pseudotsuga Douglasii*, the largest tree in the park; balsam, *Abies subalpina*, pine, *Pinus Engelmannii*, red cedar, *Juniperus Virginiana*, poplar, *Populus tremuloides*, and willow, *Salix*, of several species. These forests are of great importance in conserving the rain which falls. Many of the most important rivers of the western United States rise in this region, the Missouri, the Yellowstone, the Wind, the Big Horn, the Platte, the Green (afterward the Colorado), and the Snake, which flows through Wyoming, Idaho and Washington, emptying into the Columbia, and thus reaches the Pacific.

Yellowstone Park, notwithstanding its wild grandeur as a mountain domain, is yet more interesting on account of the geological wonders which are found within its boundaries, namely the geysers and hot springs. The geysers are actively throwing up in jets at periodic intervals, steam and boiling water; the hot springs are either quiescent, or are bubbling and boiling without explosive eruption. They are found in four distinct areas in the Park; the geysers and the hot springs in the Upper, Lower and Norris Geyser Basin, hot springs only in the Mammoth Hot Spring Region. This division also accords with the predominating chemical content of the waters. In the Upper, Lower and Norris Geyser Basins, we have springs and geysers which are actively depositing silicious material (sinter); in the Mammoth Hot Spring Basin, springs which are forming calcareous deposits, called travertine.

Much inquiry has been instituted concerning the therapeutic value of the mineral springs of the Park. Many hot spring regions throughout Europe and America are resorted to by thousands in search of health. The hot springs of Virginia are visited by hundreds every year. It is said of the Yellowstone region, that the first explorers to ascend the Gardiner River, in 1871, found numbers of invalids encamped on the banks, where the hot waters from Mammoth Hot Springs enter the stream; and it is recorded that they were most emphatic in their favorable impressions in regard to their sanitary

effects. No one now goes to the Park on account of its mineral waters. It would, therefore, be premature to assume that there is no medicinal virtue in them. Two great drawbacks are to be encountered, and these alone are sufficient to explain why the Yellowstone will probably never become a resort for invalids. Inaccessibility, length and severity of the winters are sufficient obstacles to the National Park ever becoming such a resort. The open summer season lasts only about three months.

The hot springs and geysers, on the other hand, are interesting to the geologist, because of the remarkable phenomena connected with their origin and activity; to the botanist they are fascinating, because of the low forms of vegetal life found existing in them even at high temperatures.

As before stated, the waters which run from the hot springs and geysers of the Yellowstone may be comprehended under two heads—those which deposit silica, as sinter, and those which form calcium carbonate, as travertine. The last-mentioned substance is only found in the Mammoth Hot Spring Basin; the latter makes up the characteristic formations of the Norris, Lower and Upper Geyser Basins. The question naturally arises, how are the beautiful terraces which surround many of the hot spring centres formed? Are they not simply built up by the deposition of new material from the overflow water, as it evaporates and cools at the surface? At first sight, it would seem that the craters and bowls of the geysers and hot springs were formed in this way, because we know that boiling water, under pressure, will dissolve and hold in solution much more inorganic material than ordinary river or spring water at the normal temperature, and that in many instances, when the pressure is relieved and the temperature lowered, the water will precipitate its mineral contents.

In the case of the richly carbonated waters of the Mammoth Hot Springs, calcium carbonate is deposited by the relief of pressure, by the escape of the carbon dioxide and by the evaporation of the water; but this physical process is not the sole cause of the varied and beautiful terraces, which will presently be described. At the Norris Geyser Basin, relief of pressure and cooling will cause a separation of silica from the hot waters, but the waters of the other geyser basins contain very much less silica, and, as far as has been observed by geologists, neither relief of pressure nor cooling will

produce a separation of the silica. Water collected from the springs and geysers of the Upper and Lower Geyser Basins was perfectly transparent, and remained clear and without sediment after standing for several years. Experiments showed that the silica in these waters remained dissolved, even when the water was cooled down to the freezing point, and it was only after the crystallization of the water by freezing that the silica was separated and settled down as an insoluble flocculent precipitate upon melting the ice.

How, then, are we to account for the production of the exquisite terraces, mounds, pools and geyser cones? It has been proved, in addition to the causes operative in the above instance, that the rapid deposition of the sinter and travertine from both classes of water is due to the action of vegetation in removing the carbon dioxide from carbonated waters, thus depositing calcium carbonate, and, in the case of the silicious waters, depositing by the activity of the protoplasm a gelatinous silica, which, upon exposure, finally hardens. We know, from numerous observations, that plants are active in rock building and disintegration.

The plants of the Carboniferous Period, by their death and consolidation, formed the extensive and useful coal beds. Sphagnum and mosses compacted yield peat, and, in some cases, soft coal. Silicious diatoms have given rise to extensive diatomaceous earths. In several of the higher algæ, for example, *Halimeda opuntia*, the carbonate of lime deposited by the plant forms a sieve-like cover about the tips of the algal filaments, and, in *Acetabularia*, it occurs as a tube about the stalk of the plant. In the CHARÆ the lime is separated and deposited in the cells and cell walls of the back alone, while in the *Corallines* it is found only within the cells. Nor is our knowledge of the activity of protoplasm in the deposit of mineral substance solely confined to plants. We know that many animals secrete silex and carbonate of lime, foraminifera, coral polyps and molluscs generally. Before, however, we can understand the part which vegetation has played in forming the travertine and sinter beds of the Yellowstone Park, we must become familiar with the general appearance and character of the deposits themselves.

First in importance among the many points of interest accessible are the Hot Spring Terraces. These have been built one upon another, until the present active portion constitutes a hill rising 300 feet above the site of the Mammoth Hot Springs Hotel. The for-

mation about these springs, it will be remembered, is calcareous, and to this fact is due its distinctive character, so different from the silica formations which prevail elsewhere in the Park. "The overhanging bowls which these deposits build up are among the finest specimens of Nature's work in the world, while the water that fills them is of that peculiar beauty to be found only in thermal springs." Cleopatra Spring, Jupiter Terrace, Pulpit Terrace, Minerva Terrace, are among the most interesting and beautiful of the active springs. One of the most beautiful is a pool filled with pellucid water in violent ebullition. The sides and bottom of the basin are formed of pure white travertine, while the varying depths cause the water to appear all shades of blue and green, from a deep peacock blue in the deeper parts of the bowl, to the lightest of Nile greens in the shallow recesses. In wandering about the terraces, one is much impressed with the brightly tinted basins about the springs, and the red and orange colors of the slopes overflowed by the hot waters. These colors are due to the presence of the microscopic plants, algæ of several forms and species. In the cooler springs and channels similar vegetation forms the bright green, orange or brown membrane-like sheets, or masses of jelly without apparent vegetal structure. Silken yellow filaments are found in bowls and channels of the hottest springs. Words fail to convey an adequate idea of the massive marble-like terraces, rising tier upon tier, and the exquisite coloring of their sides and the margins of the bowls filled with steaming hot water of most magnificent iridescent hues.

The silicious formations are similar, although not raised in terraces so grand or imposing, simply because the formation of silicious sinter is much slower than the formation of the travertine, and because the region seems to be of later geologic age. Many of the geyser cones are bee-hive in shape, of a white adamantine-like appearance, and are, as a rule, delicately colored by pale greens and pinks of exquisite variation. The many hundreds of springs of the Upper Geyser Basin, where they are seen at their best, are generally characterized by the transparent clearness of the water, which appears of varying shades of blue and green, according to the depth and amount of light admitted. Morning Glory Spring is one of the most beautiful springs of the Park, with a funnel-shaped cone suggesting the flower, and with walls most delicately colored.

Black Sand Basin is, however, most interesting for our pur-

pose. The description of Dr. Peale is interestingly comprehensive, and is as follows: "This is one of the most beautiful springs in the Upper Basin. It has a delicate rim, with toadstool-like masses around it. The basin slopes rather gently toward a central aperture, that, to the eye, appears to have no bottom. The water in the spring has a delicate turquoise tint, and as the breeze sweeps across its surface, dispelling the steam, the effect of the ripple of the water is very beautiful. The sloping sides are covered with a light brown crust; sometimes it is rather a cream color. The funnel is about 40 feet in diameter, while the entire space covered by the spring is about 55 x 60 feet, outside the rim of which is a border of pitch stone (obsidian) sand or gravel, sloping 25 feet. From its west side flows a considerable stream, forming a most beautiful channel, in which the coloring presents a remarkable variety of shades; the extremely delicate pinks are mingled with equally delicate tints of saffron and yellow, and here and there shades of green."

The overflow from this spring spreads out over a large area, called Specimen Lake, where absorption of the silica from the water has destroyed many of the trees of the vicinity, the dry, lifeless trunks adding to the attractiveness of the place by affording the appearance of petrifications.¹ All of these exquisite masses of colors which are found lining the pools, filling the overflow channels and spreading out flat in the lower marshy places, are due to the growth of vegetal organisms belonging to the bacteria and algæ.

Walter H. Weed² describes the appearance of the Black Sand Basin and channels filled with algal growths: "As the water from this spring flows along its channel it is rapidly chilled by contact with the air and by evaporation, and is soon cool enough to permit the growth of the more rudimentary forms which live at the highest temperature. These appear first in skeins of delicate white filaments which gradually change to pale flesh-pink farther down stream. As the water becomes cooler, this pink becomes deeper, and a bright orange and closely adherent fuzzy growth, rarely filamentous, appears at the border of the stream, and finally replaces the first-mentioned forms. This merges into yellowish-green, which shades into a rich emerald farther down, this being the common color of fresh-water algæ. In the quiet waters of the pools fed by this stream

¹ Haynes-Guption, *Guide to Yellowstone Park*, p. 68.

² Weed, *Ninth Annual Report U. S. Geological Survey*, p. 657.

the algæ present a different development, forming leathery sheets of tough gelatinous material, with coralloid and vase-shaped forms rising to the surface, and often filling up a large part of the pool. Sheets of brown or green, kelpy or leathery, also line the basins of warm springs whose temperature does not exceed 140° F., but in springs having a higher temperature the only vegetation present forms a velvety, golden-yellow fuzz upon the bottom and sides of the bowl. This growth is rarely noticed in springs where the water exceeds 160° F., except at the edge of the pool. If the basin is funnel-shaped, with flaring or saucer-shaped expansion, algæ grow in the cooler and shallower water of the margin, forming concentric rings of yellow, old gold and orange, shading into salmon-red and crimson, and this to brown at the border of the spring. Around such springs the growth at the margin often forms a raised rim of spongy, stiff jelly, sometimes almost rubber-like in consistency, and red or brown in color. Evaporation of the water drawn up to the top of such rims leaves a thin film of silica, which thickens to a crust and so aids in the production of a permanent sinter rim."

Near some springs, for example near the Emerald Pool, algal channels are formed and the waterway is floored with a sheet of olive or emerald green, kelpy jelly. Where there is a moderate current, this lining is nearly smooth, resembling a sheet of wet leather, but in quieter waters this soft carpet is dotted with little warty excrescences, and little pillars produced by the upward growth of the algæ; the pillars sometimes terminate by balloon-like caps or globes containing bubbles of gas. When, by their upward growth, these pillars reach the surface of the pool, they increase rapidly in diameter, and form flat, cap-shaped formations which sometimes merge into table-like expansions of quite peculiar form. The continued growth of new pillars dams up the outlet, and the water collecting forms shallow lagoons or pools of varying degrees of temperature. As the temperature changes, the nature of the growth changes, the bright-colored algous jelly forming the outer covering of the pillars changes to light salmon-pink, and the substance itself becomes noticeably silicious, or forms a filmy web upon the silicious centre.

It has been for some time known that the hot springs of the world support various growths of microscopic plants. Agardh and Corda recognized and described such in the hot springs of Carlsbad,

Bohemia. Later, Cohn, in 1862, showed that the algæ of these springs deposited travertine. Sir William Hooker, in 1809, found CONFERVACEÆ at the borders of many of the hot springs there. *Conferva limosa*, *C. flavescens*, *C. rivularis* were abundant in the water. Baring Gould, who visited the Icelandic geyser region in 1864, found in the overflow channels of the spring, Tunguhver, a species of the genus *Hypheothrix*, common in hot waters all over the world. In New Zealand, the presence of algæ in hot springs has been determined. In the hot springs of the Azores, Mr. Moseley found algæ forming a pale yellowish-green layer an inch and a half thick. The temperature of the water was 176° F. to 194° F. A thick, brilliant green growth, consisting of *Chroococcus* was found at the edge of a shallow pool of hot water, where the temperature was between 149° F. and 156° F.

In the hot springs of the Yellowstone no plant life has been found at a temperature exceeding 185° F., some degrees below the boiling point of water, which, at the altitude of the park (7,000–8,500 feet) is 198° F. The most luxuriant growth of algæ is found in water which has cooled down to a temperature of 104° F. to 122° F. In water of a temperature ranging from 100° F. to 125° F., we have the greatest display of color, because many green algæ can live in water of that degree of heat. In the hottest waters (185° F.) only white filamentous bacteria are found, which gradually become of a sulphur-yellow color at 175° F. This yellow growth is due to a species of *Beggiatoa*, a plant which may be classed with the BACTERIACEÆ, and which, during life, deposits sulphur granules.

As the water cools down, other forms of vegetable life appear, give variety to the colorations and give beauty to the borders of the hot pools and overflow channels leading from them. The sequence of temperatures and of colors is somewhat as follows: white, 160° F.–185° F.; yellow, 145° F.–160° F.; red, 130° F.; green, 110° F.–130° F.; green-orange-brown, 95° F. There are variations, however, in the sequence of these colors, owing to various environmental conditions. Thus, in the Black Sand Basin and Specimen Lake, the range of color is somewhat this: White, yellow, flesh pink, bright pink, yellowish-green, emerald.

Studying the growths at the several temperatures, we find *Leptothrix laminosa* growing at 135° F.–185° F.; *Phormidium* at 165° F.; *Beggiatoa* at 150° F.–165° F., and *Spirulina* at a lower temperature.

Gleocapsa, a blue-green alga, is found growing on the sides of geyser cones, where steam is escaping, forming there a delicate olive-green coloration. A kind of fibrous sinter is formed by the growth of the little alga, *Calothrix gypsophila*, or the young form of *Mastigonema thermale*, the latter olive-colored, and forming the sinter of the crater of the Excelsior Geyser.¹ A coarse sinter is due to a bright red species, *Leptothrix*, a finer variety to *Leptothrix* (*Hypheothrix*) *laminosa*, ranging in color from white to flesh pink, yellow and red to green, as the water cools. Besides the above plants, which belong to the BACTERIACEÆ and the CYANOPHYCEÆ, speaking in a general way, we find that several mosses, MUSCI, are active in the formation of sinter on the slopes below Hillside Spring. These springs issue from the rhyolite slopes beneath the cliffs of the Madison Plateau, and the waters, whose temperatures are 184° F.-198° F., contain both silica and lime in solution, which they deposit in their downward flow. This moss has been determined by Prof. Charles R. Barnes, of the University of Wisconsin, to be *Hypnum aduncum*, var. *grasilescens*, Br. and Sch.

Besides the sinter and travertine formed by algæ, which remove in the case of the carbonated waters, containing calcium bicarbonate, $\text{Ca}(\text{HCO}_3)_2$, in solution, the gaseous carbon dioxide, thus depositing calcium carbonate, CaCO_3 , we have stalactites produced by the growth of several algæ, *Gleocapsa violacea*, *Schizothrix calcicola*, *Synechococcus æruginosus* and *Phormidium* (*Leptothrix*) *laminosum*. An interesting account of the formation of these stalactites has been given to us by Miss Josephine Tilden, who visited, recently, the Yellowstone Park.

In the tepid waters of the overflow basins, for example Specimen Lake, which is produced by the water from the Black Sand Pool, we find extensive diatomaceous beds formed by the growth of numerous diatoms. The water of these areas has encroached on the timber, killing the trees, which stand as bare poles from the treacherous marshes. It is known that these plants deposit silica, as a box, test, or frustule, and it is thus by the activity of the protoplasm that the silicious diatomaceous earths are formed. Samples of this material show the presence of *Denticula valida*, which forms the bulk of the material, *Denticula elegans*, *Navicula major*, *N. viridis*, *Epithema*, *Cocconema*, etc.

¹ Weed, loc. cit.

It seems likely to me, in studying the vegetation of hot springs, notwithstanding the statements of Prof. Ernst Hæckel, of Jena, in his interesting work, "Systematische Phylogenie der Protisten und Pflanzen," that the early forms of life on this globe were green unicellular algæ, and from these by retrogression and development other forms have sprung, animal life appearing later than plant, it seems to me, I repeat it, that we must look to the hot springs for the most primitive forms of life, because the temperature conditions are such as more nearly to simulate the conditions existing when this world of ours was in a highly heated state, when seismic phenomena were the rule rather than the exception. It would be necessary in order to establish this proposition to investigate comparatively the vegetation of all the hot springs of the globe, before it would be safe to make such a general declaration as to the origin of vegetal life.

The above ecological sketch sufficiently discloses the salient characters of the interesting geysers and hot springs of the Yellowstone Park. In preparing this article, the writer has endeavored to give the results of personal observation on the spot during eight days of August, 1897. He has been materially aided in its preparation by the following papers and books, which give a somewhat more detailed account of the Yellowstone Wonderland:

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UNIVERSITY OF PENNSYLVANIA, November 16, 1897.

POMEGRANATE RIND.

BY HENRY TRIMBLE.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy. No. 171.

At this season of the year pomegranate fruit is frequently seen on the market stalls of Philadelphia and other Northern cities, and is brought here from Spain. Small quantities of the fruit are raised in the Southern States and in California, but so far it has never attained much popularity with us, partly, no doubt, on account of

the price, but more because we have not tried the exceedingly juicy and slightly acid pulp.

Since the main object of this paper is to consider the constituents of the rind or peel, it is not necessary to dwell on the history, source, etc., of the plant and its fruit, as full descriptions of them are to be found in several text-books.

The rind of the fruit has long enjoyed a reputation in medicine as an astringent, especially in chronic cases; it also possesses, in some degree, the anthelmintic properties of the root and stem barks.

The most important constituents of the rind are the yellow coloring matter and the tannin; the former has been employed considerably as a dye, especially in producing yellow morocco leather. The tannin has been used in the manufacture of leather in nearly all the countries where the fruit is found.

The writer has always been somewhat skeptical about the high percentages of tannin which have been reported, and has undertaken to verify or refute them.

The fresh rind from some Spanish pomegranates purchased in the Philadelphia market gave the following results:

	Per Cent.
Moisture	56.66
Ash in absolutely dry substance	3.92
Tannin " " "	28.38

The figures obtained by Mr. Griffith H. Maghee, a student in the Laboratory, confirmed these, although his estimations were made on different lots of rind. Others have reported from 20 to 30 per cent. of tannin.

Flückiger found 5.90 per cent. ash in the rind dried at 100° C., as in the above case. A recent estimation on a new lot of rind gave me 3.68 per cent. ash in dry substance.

A quantity of the tannin was extracted from the rind with acetone, and purified according to the usual method; on drying at 120° it yielded, on combustion, the following results:

	Per Cent.
Carbon	52.11
Hydrogen	4.17
Oxygen	43.72
	<hr/> 100.00

A portion of the tannin dissolved in water gave the following characteristic reactions:

Ferric salts	Blue-black precipitate.
Bromine water	No precipitate.
Calcium hydrate	Yellowish ppt., turning brown.

These reactions correspond with those of gallotannic acid, and the combustion results show a composition very similar to the same acid, so it may safely be concluded that the tannin of pomegranate rind is identical with gallotannic acid. This is in accord with the results obtained by Culley¹ on the tannin of the root bark.

¹ AMERICAN JOURNAL OF PHARMACY, 1894, page 280.

THE DIGESTIVE POWER OF PEPSIN IN THE PRESENCE OF ALCOHOL.¹

BY C. SYMES, PH.D.

Some years ago I conducted a series of experiments with a view of determining the relative digestive value of the various pepsins then on the market, and published the result of the inquiry.² Subsequently I was requested to continue and extend the investigation for publication in one of the medical journals, and in consequence I gained some amount of experience in this kind of work. The experiments were carefully conducted and, after a lapse of time, were repeated by a French investigator, who confirmed my results. Time, "which tries all things," also testified to their correctness, for the pepsin, which was then mostly prescribed and relied on, has since practically disappeared from the market, its quality having been found by experience to be inferior to that of similar preparations by other makers. Apart from the relative value of various pepsins, I also experimented on the digestive power possessed by pepsin in the presence of alcohol, and found that its activity was reduced in proportion to the amount of alcohol present. From this I drew deductions which I have since learned to modify, although the facts remain. I condemned wine as a vehicle for the administration of pepsin because of its property of retarding the activity of the medicinal agent it carried, and recommended in the place thereof a solu-

¹ *Pharmaceutical Journal*, November 6, 1897.

² *Pharmaceutical Journal* (3), IV, 1. See also note on "Latent Pepsin," by G. W. C. Phillips, in *Pharmacist*, VIII, 200, and "Year Book of Pharmacy," 1875 p. 317; paper on "Pepsin and Alcohol," by M. Bardet, *Nouveaux Remèdes*, 1887, p. 243, and *Pharmaceutical Journal* (3), XVIII, 93; and paper on "Pepsin Wine," J. Clark, *Pharmaceutical Journal* (3), XXII, 597.

tion of fresh pepsin in raspberry vinegar. This constitutes an excellent preparation, and at present I know of no better; but the public never took very well to this "pepsin elixir," as many persons have a decided objection to acids. It has, however, been prescribed with satisfactory results.

The experiments referred to were conducted in glass bottles placed in a water-bath kept at a uniform temperature of 100° F. by means of a Reichart's thermo-regulator. The importance of adopting the same temperature on all occasions when conducting comparative experiments was rendered evident by increasing the temperature to 110° F., when digestion was found to proceed much more vigorously than at 100° F., all other conditions being equal. Still, the presence of alcohol had the same prejudicial effect in retarding solution of the coagulated albumen used. If, however, the bottles were replaced by wetted animal membranes, the condition of things was materially altered. It was found that the alcohol present in the liquid through which the coagulated albumen was distributed soon began to diffuse through the wetted membrane, and that the pepsin commenced to act with the same energy as in those containers where no alcohol was present, so that at the end of two hours there was no considerable difference between the weight of undissolved albumen in each case. The interest which this experiment has for us, as pharmacists, is that it shows that an alcoholic liquid, such as wine, may be used in preparing a solution of pepsin for medicinal use, and that if properly made it soon becomes active when taken into the stomach in the presence of suitable food. Rectified spirit may also be used as a preservative in making essence of rennet, because its excessive dilution and ready evaporation, when mixed with the proper quantity of milk and warmed, overcome any prejudicial effect the spirit may have on the peptic bodies present. Glycerin is an excellent solvent of pepsin, as is well known; but unless it is used in sufficiently large quantity to render the solution distasteful to the patient, it is not a good preservative. A solution of freshly prepared undried pepsin in dilute glycerin, to which 10 per cent. of rectified spirit is added, forms, when filtered, an excellent medicinal preparation which may be flavored to taste.

THE CHEMISTRY OF CLOVE OIL¹

Erdmann has published some interesting results of his investigation of clove oil and the oil distilled from clove stalks. In preparing caryophyllene by treating clove oil with solution of caustic alkali, the undissolved portion of the oil was always found to be oxygenated, and only by using alcoholic potash was it obtained free from oxygen. Oil from clove stalks shaken with dilute caustic alkali yielded at once the sesquiterpene.

On treating the oil that is separated from clove oil by solution of caustic alkali, with alcoholic potash, and adding some ether to dissolve and separate the terpene, the alkaline solution was found to contain eugenol, which was separated on acidifying with sulphuric acid, and on distilling the acidified liquid, acetic acid was obtained. Hence it was evident that clove oil contains, as one of its constituents, aceteugenol, a compound which is at once saponified by alcoholic potash, but less readily by a water solution of caustic alkali, and thus the presence of oxygen in the oil undissolved by caustic alkali solution was accounted for, as well as the circumstance that neither this undissolved oil nor clove oil itself has a constant boiling point. That is not due to difference in the amount of caryophyllene; for though it has a somewhat higher boiling point than eugenol, the tension of both substances is nearly the same at 123° C., under a pressure of 13 millimetres, and the higher boiling-point, 125° to 150° C., of the oil undissolved by caustic alkali is due to the presence of aceteugenol.

In the determination of eugenol in clove oil by Thoms' method,² it is assumed that the whole of the eugenol is present in the free state, and the question arose whether the presence of some portion of it in the state of ester affected the determination. That was found to be the case by comparative experiments with clove oil previously saponified by heating to 100° C., with caustic alkali, and with oil which had not been so treated, the results given by three samples being as follows:

	Thoms.	Total eugenol.
Clove oil, A	83.9	85.68
Clove oil, B	{ 82.97	
	{ 82.77	84.84
Clove oil, C	80.2	81.9

¹ *Jour. Prakt. Chem.*, LVI., 175, through *Pharmaceutical Journal*, November 6, 1897.

² *Pharmaceutical Journal*, (3), XXII, 450.

The low specific gravity of the oil distilled from clove stalks, as compared with the large amount of eugenol it contains, is explained by the absence of aceteugenol, the relation between the specific gravity and the amount of eugenol in the case of clove oil being due to the presence of some aceteugenol, the specific gravity of which is much greater than that of eugenol.

On saponifying clove oil with a known quantity of alcoholic potash, and determining the residual free alkali, a result was obtained indicating the presence of a much larger quantity of aceteugenol than was actually present, and this was ascertained to be due to the presence of a compound yielding salicylic acid, the occurrence of which in clove oil was pointed out by Schenck,³ but disputed by Wassermann.⁴

By merely shaking clove oil with solution of caustic alkali, no indication of salicylic acid is obtained; but after the saponification effected by boiling with soda solution, salicylic acid can be detected in the aqueous liquor. It is suggested that the compound present in clove oil, and yielding salicylic acid by saponification, may be eugenol ester of acetyl salicylic acid.

The yellow coloration produced on treating clove oil with caustic alkali was suggestive of the presence of an aldehyde, and a product was obtained which proved to be furfural, a substance which Messrs. Schimmel have also found in clove oil, together with normal amyl-methyl ketone, to which they attribute some influence as to the cause of the ether-like odor of clove oil, which a mixture of eugenol, caryophyllene and furfural does not possess.

Erdmann also suggests that eugenol is probably not the only phenolic constituent of clove oil, because the boiling-point of the crude product has a wider range than is consistent with its chemical individuality, and also because in redistilling eugenol he has obtained a residue of phenolic character, though its resinoid character did not invite further investigation.

³ *Ann. Chem.*, 125, 14.

⁴ *Ann. Chem.*, 179, 369.

RECENT LITERATURE RELATING TO PHARMACY.

ASCLEPIAS CURASSAVICA AS AN INSECTIFUGE.

The following information concerning the uses of this plant is taken from the *Kew Bulletin*, October, 1897, and which, as there stated, appears to be unrecorded:

The plant grows everywhere, as a weed about the Isthmus of Tehuantepec (Southern Mexico), and is used by the Indians there to keep away vermin, especially fleas, for which latter purpose it is reported as being most successful. They make a rough broom of it, and sweep the floors and walls of their huts, and find that they are not troubled with fleas for a considerable time afterwards. They have tried brushing dogs with it when their coats are full of vermin, and it appears to answer the same purpose with them.

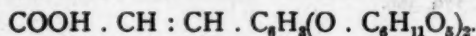
The Indian name of the plant is "Chilpati."

DETERMINATION OF THE ALKALOIDS IN SOLANUM CAROLINENSE.

In a recent communication (*The Journal of Pharmacology*, Vol. 4, p. 225), Charles Gundlich refers to the results obtained by G. A. Krauss and Professor J. U. Lloyd in their investigations of *Solanum Carolinense*. He then outlines the processes which he employed for the extraction of the alkaloidal constituents of the drug. The alcoholic liquid in which the fruit was preserved was examined by various methods, but only traces of alkaloid could be found. Then an examination of the fruit was undertaken, but only traces of alkaloid were found in 500 grammes of material. Next, 10 grammes of the powdered root were examined, using various solvents for the extraction of the alkaloid, but only traces could be found. Lastly, 1,000 grammes of the finely-powdered root were treated with dilute acetic acid (10 per cent.), but with no better results. At this juncture, the author learning that Professor Lloyd had used several hundred pounds of drug for obtaining his material, the investigation was given up.

CAFFETANNIC ACID.

Paul Cazeneuve and E. Haddon (*Compt. rend.*, 1897, 124, 1458-1460) have recently studied this subject. Since the investigations of Hlasiwetz, caffetannic acid has been usually regarded as having the formula $C_{15}H_{15}O_8$, but the authors, from a study of the behavior of the substance towards phenylhydrazine, conclude that it has the composition $C_{21}H_{22}O_{14}$, and ascribe to it the constitutional formula:



The *osazone* of caffetannic acid, $C_{46}H_{48}N_8O_{10}$, crystallizes in yellow needles, very sparingly soluble in alcohol, and melts at 180° ; it is insoluble in most media, and is so sparingly soluble in phenol and naphthalene that no determinations of molecular weight have been possible.

The sugar, $C_6H_{12}O_6$, obtained on hydrolyzing caffetannic acid, will be described in a subsequent paper.—*Journal of the Chemical Society*, London, October, 1897.

PREPARATION OF HYDROGEN PEROXIDE.

Hydrogen peroxide may rapidly and economically be prepared, according to Pedro Etchegorry (*Tribuna Farmaceutico*, 1, 16), by triturating with ice a mixture of 1 part barium peroxide and 2 parts (by weight) of hydrochloric acid. The following reaction takes place.



The filtered solution is treated with a solution of silver sulphate until no more precipitation occurs, according to the following reaction:



On filtering, the barium sulphate and silver chloride are retained on the filter, while the hydrogen peroxide passes into the filtrate in a state of purity.

This process has already appeared in some text-books on chemistry and, consequently, is not new; but it seems worthy of further investigation.

CAFFETANNIC ACID (GLUCOSYLCAFFEIC ACID) AND ITS DECOMPOSITION INTO CAFFEIC ACID, VINYLCATECHOL, AND CATECHOL.

Hermann Kunz-Krause (*Ber.*, 1897, 30, 1617-1622) has recently studied this subject. Both caffetannic acid and matetannic acid, when hydrolyzed, yield a syrupy sugar and caffeic acid (dihydroxycinnamic acid). This acid, when heated at 200° , readily loses carbonic anhydride, yielding vinylcatechol (3:4-dihydroxycinnamene), the decomposition at this temperature being quantitative. A characteristic reaction for vinylcatechol is the one previously mentioned (*Arch. Pharm.*, 1893, 231, 635). This reaction is also given by Tiemann and Will's hesperetol or vinylcatechol paramo-

nomethyl ether (Abstr., 1881, 739). The carmine-red coloration with sulphuric acid therefore appears to be characteristic of 3:4-dihydroxycinnaniene and its ethers. The author has only succeeded in obtaining the vinylcatechol as an amorphous powder; it is a somewhat unstable substance, for when distilled under a pressure of 12 millimetres it is decomposed, the chief product being catechol. The author thinks it probable that caffetannic acid is distributed throughout the vegetable kingdom in very much the same manner as choline.—*Journal of the Chemical Society*, London, October, 1897.

CHINESE BANDOLINE WOOD.

The origin of this curious product, of which a specimen has long been in the Museum of the Royal Gardens, has always been a puzzle.

Shavings of the wood yield a mucilage, when soaked in water, which is used by Chinese ladies in "bandolining" their hair. Dr. E. Bretschneider ("Notes on Some Botanical Questions Connected with the Export Trade of China," 1880, p. 14,) mentions the shavings as being exported from Canton to Peking, under the name of "meio kao pao hua" (*i. e.*, cosmetic glue shavings), and their probable source as *Sterculia plantanifolia*. In 1895, G. M. H. Playfair, Esq. H. B. M. Consul at Ningpo, sent to Kew specimens in leaf of a tree, called "tiao chang," which he had collected in the mountains near Ningpo, with the information that shavings of the wood were used for the purpose described above by the women of that part of China. These specimens were identified as *Machilus Thunbergii*, Sieb. et Zucc., and flowering specimens subsequently received from the same gentleman confirmed the identification. Mr. Playfair further adds, on the authority of Dr. A. Henry, that the Canton shavings are from the same tree.

The species is a native of Hong Kong and Chekiang westward to Szechuan, in China; also of Formosa, Japan, and the Corean Archipelago. Owing to the interest attaching to the identification, the species has been figured in Hooker's "Icones Plantarum" (t. 2538).—*Kew Bulletin*, October, 1897.

FUNCTION OF TANNIN IN PLANTS AND ESPECIALLY IN FRUITS.

C. Gerber (*Compt. Rend.*, 1897, 124, 1106-1109) has practically studied this obscure but interesting subject, and reached the following conclusions: In the respiration of soft fruits containing tannin,

the volume of the carbonic anhydride evolved is less than that of the oxygen absorbed so long as any tannin remains unaltered. As soon as all the tannin has disappeared, pectin is produced. If the temperature is so low that the cellular activity is not great, the respiration quotient remains lower than unity; but if the temperature is so high that the cellular activity requires more energy than is furnished by the free oxygen, the cellules obtain the necessary energy from the alcoholic fermentation of the sugars, the carbonic anhydride produced by it being added to that produced by respiration, and thus giving a quotient higher than unity. It follows that one of the principal functions of tannins in fruits is to prevent pectic transformations, and thus check the fermentation of the sugars.

Direct experiments with the fruit of *Dyospyros kaki* show that the disappearance of tannins does not involve an increase in the amount of sugar, and experiments on the respiration of *Sterigmatacystis nigra* on a solution of nut-gall tannin lead to the same conclusion. In fruits containing tannins, the latter disappear as the result of complete oxidation, without forming any carbohydrates.—*Journal of the Chemical Society*, London, October, 1897.

LICORICE ROOT GROWN IN NEW SOUTH WALES.

In the *Northern Star*, Mr. W. Finselbach, Ph.D., Lismore, N. S. W., mentions that at a recent local agricultural show, the Government Experimental Farm exhibited two samples of Spanish licorice root, the stolens or suckers, only two years old, being 12 feet long. While a student under Professor Flückiger, in Strassburg, and while travelling in Italy, he had frequently examined three and four-year-old roots, running from 9 to 10 feet long, showing that the soil and climatic conditions of the Lismore district, at any rate, were very favorable to the growth of the plant. He states that he has made an analysis of the samples exhibited, and finds them to be of first-class quality, although they have not secured full maturity. In parts of Italy he saw the licorice cultivated on maize fields. The plant requires three, and, in wet seasons, even four, years, to mature, and the general custom where licorice is grown rationally is that a crop of another kind should be found on the same field. An acre in Europe is said to produce three or four tons of the roots, worth on the London market 12s. to 16s. per cwt. There is a large consumption of the root in the United Kingdom; Mr. Finselbach says,

in the brewing trade as well as for medicinal uses, and we may add in confectionery. The largest consumers, however, are the United States. Mr. Finselbach suggests that the plant, which can be grown from suckers, would be a remunerative crop in certain districts.—*The Pharmaceutical Journal of Australasia*, August 28, 1897.

ON MORRHUOL AND THE ALLEGED IODINE AND THE BROMINE CONSTITUENTS IN COD-LIVER OIL.

Charles Gundlich (*The Journal of Pharmacology*, Vol. 4, pp. 223), reports that in experimenting with cod-liver oil for the production of the so-called morrhuol, he first tried concentrating a pure oil in a vacuum of 15 millimeters pressure at 100° C., he having surmised that this substance might be the concentrated oil. The results were negative.

A sample of crude oil, having a specific gravity of 0.923, and Hehner value 95.15 (percentage of insoluble fatty acids), was then treated, after ascertaining its freedom from free acids, with 80 per cent. alcohol. The alcoholic extract was evaporated, and the product obtained had a specific gravity of 0.900 at 19° C., and congealed at 4° C. In these respects it corresponded with samples of purchased morrhuol (one foreign, one domestic), as well as in taste, odor and color. The author is, therefore, of the opinion that the commercial product is prepared in a like manner from any crude product sold as cod-liver oil.

Tests for iodine and bromine showed that they were neither present in the crude oil used in the preceding experiment nor in the purchased morrhuol.

The latter appeared to be a mixture of various impure fatty oils, for, after repeated attempts at fractional distillation, no products could be isolated having a uniform boiling point.

An examination of the crude cod-liver oil and the morrhuol for amine derivatives revealed their presence in each. The process for the separation of the amines was applied to a sample of oil from which morrhuol had been extracted by treatment with alcohol, and the results showed that a large proportion of the alkaloids had been removed by this treatment. The conclusion is therefore reached that morrhuol contains a considerable quantity of amines.

A NEW ALKALOID, RETAMINE.

Battandier and Malosse (*Jour. de Ph. et de Chim.* [6], 6, 241) have separated from the young branches and bark of Retama

sphaerocarpa, by the ordinary processes, a perfectly definite alkaloid, which they have named *Rétamine*. A kilogramme of the fresh plant furnished some 4 grammes of alkaloid. This alkaloid is slightly soluble in water and in ether; alcohol and petroleum ether dissolve it more readily; and chloroform dissolves it very readily, but not without some decomposition. It crystallizes in long needles by chilling the saturated petroleum ether solution, and in prismatic plates by similarly cooling the saturated alcoholic solution; the spontaneous evaporation of its alcoholic solution yields beautiful rectangular tables. It is dextrogyre, melts at 162°C. , and decomposes at a higher temperature, giving a sublimate in long needles, and other products having the odor of pyridine.

Rétamine imparts a distinct color to phenolphthalein. It is a powerful base, which combines energetically with acids, and yields clearly-defined salts. It displaces ammonia, especially with heat, and precipitates the hydrates of iron, copper, etc. The caustic alkalies precipitate it from its saline solutions. It possesses extremely energetic reducing action—the chloride of gold and phosphomolybdic acid are instantly reduced, the salts of silver and ferricyanide of potassium are more slowly reduced, while the mercuric chloride is changed to the mercurous salt. It gives the general reactions of alkaloids and furnishes with potassium bismuth iodide, a beautiful red precipitate. The chloride of platinum is not precipitated by it, but it gives feebly, with ammonium sulphide, the reaction of sparteine.

The salts of *rétamine* crystallize very easily and with great distinctness, except the nitrate, which has only been obtained in the form of a varnish. The salts which have been studied contain for 1 molecule of *rétamine*, either 1 or 2 molecules of monobasic acid.

The solubility in absolute alcohol is 2.462 parts in 100 of solvent. The specific rotation is $[\alpha]_{\text{D}} = 43^{\circ}, 15'$. The elementary analysis indicated the formula $\text{C}_{18}\text{H}_{28}\text{N}_2\text{O}$. It is probably an oxysparteine, but differs from the artificial oxysparteine known at present.

THE TREATMENT OF TUBERCULOSIS WITH CINNAMIC ACID.¹

It is interesting to note that a remedy is recommended for the treatment of tuberculosis, which is neither a new synthetic compound nor a product of some manufacturing firm.

Dr. T. Heusser, of Dayos-Platz (*Therapeutische Monatshefte*;

¹ *The New York Medical Journal*, October 16, 1897.

Therapist, September 15, 1897), relates his experience with cinnamic acid in the treatment of tuberculosis. He states that the theory upon which the method of using cinnamic acid is based, was propounded by Landerer in 1888. The important points to be noted in the treatment are: (1) Induction of general leucocytosis. (2) Aseptic inflammation of the tuberculous centre, commencing with a circumvention and permeation of the tubercles with leucocytes, subsequently with young vessels and vascular tissue. To bring about these conditions, Landerer used an intravenous injection of an emulsion of cinnamic acid; but Dr. Heusser prefers to use gluteal injections of the emulsion on account of the danger attending the former method of administration. He uses a minim and a half of a 5 per cent. emulsion for the beginning dose, which he increases gradually with each injection. If the symptoms are favorable, these are made every second day. The maximum dose is 15 grains and is continued until the end of the treatment, which is continued for a month after all symptoms disappear.

In summarizing his opinions with regard to his experience with this treatment, the author stated that: (1) Cinnamic acid is a drug having great influence on tuberculosis. (2) The gluteal cinnamic acid injections, if cautiously made, are absolutely innocuous. (3) The gluteal cinnamic acid treatment is capable of curing a considerable number of cases of pulmonary tuberculosis. (4) Cinnamic acid is not a specific against tuberculosis.

Citric acid is reported as manufactured in San Diego, Cal., a factory for its manufacture, along with oil of lemon, having been established in 1896. It takes from four to six weeks to condense the juice from 60 to 70 pounds of lemons into 1 pound of acid. The factory employs seven hands, has steam works, and a capacity for 40,000 lemons a week; only culls are used.—*Chem. Trade Jour.*, October 2, 1897.

Cadmium is meeting with an increasing demand, and the shortage in the supply still continues, notwithstanding a little more is being made in Upper Silesia (which is, practically, the only district where cadmium is produced).

The Upper Silesian production in the first quarter of the current year was 3,326 kilos, valued at 11'844 marks per kilo, against 3,256 kilos, valued at 10'261 marks per kilo in the last quarter of 1896; and 2,436 kilos, valued at 5'380 marks per kilo in the first quarter of 1896. At present, it is said the metal is lacking entirely, and urgent demands for it cannot be satisfied. If the new demand proves to be permanent, however, there will be no difficulty in meeting it, since most of the Upper Silesian ore is cadmium-bearing, and the metal can be recovered without difficulty as a by-product.—*Eng. and Mining Jour.*, October 9, 1897.

EDITORIAL.

PURE FOOD LAWS.

Last month we printed a circular letter of inquiry from the Agricultural Department at Washington, concerning adulteration of foods and drugs and laws governing them. One of the questions was: "Would a national food and drug law assist in preventing adulteration?" In the light of some years of study of food and drug laws, we have hesitated to attempt an answer to any of the inquiries, for the reason that occurrences are frequently taking place which tend to weaken one's confidence in all laws which propose to regulate the quality of foods and drugs.

One of the most notable instances of this kind occurred recently in Pennsylvania. A special despatch to the *Public Ledger*, of Philadelphia, and printed in the issue of October 30, reports that the Pure Food Bureau of the Department of Agriculture at Harrisburg seems to be laboring with the question, "Is mustard a food or poison?" We quote a part of the despatch, as follows:

A sample of ground mustard, recently sent to the Department by one of its special agents, was found to contain 70 per cent. of adulteration. Suit was brought in Monroe County, where the sample was found, against the party who sold the goods. During the trial the adulteration was not denied and was proven beyond all doubt, but the question was raised as to whether mustard was a "food" within the meaning of the pure food law. A resident medical practitioner testified that it was a poison, and not a food; the chemist of the Department testified that it was food. In giving the case to the jury the judge instructed them that the question of food was one of fact which they must decide for themselves, and if they believed it was not they must acquit the defendant, but if they believed that it was a "food," they must convict him.

To make this farce more complete, the jury disagreed as to guilt, and directed that the costs be divided between the defendant and the county. When asked for their reasons for this verdict, the foreman stated to the court that six of the jury thought that mustard was a food and the remaining six took the opposite view, and, to satisfy those who thought it was a food, they put one-half of the costs on the defendant, thus showing that they thought him about half guilty. It is such cases as this that make one skeptical about all laws which have for their object the prevention of adulteration. With such a judge and jury a national law would not be of any more value than one enacted by the State. It has been said that two many laws breed anarchy, and the same might be said of the poor administration of a few laws.

DESTRUCTION AS A MEANS OF PROTECTING PRICES.

The history of the partial destruction of the tobacco crop in Virginia in 1639, as detailed in our last issue by Professor Lloyd, finds a modern parallel in the action of the Spanish Government. In the *Cosmopolitan Magazine* for November, John Langdon Heaton, on "Some Curiosities of Farming," makes the following statement: "But perhaps the most phenomenal peculiarity of Spanish agriculture is the fostering care given it by the Government. This enlightened rule not long ago caused to be destroyed in a single province 6,000,000 tobacco plants, not because of any prejudice against nicotine, but in order not to disturb the tariff income from Havana imports. This is a tariff for revenue only."

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

THE RIGHT SIDE OF THE CAR. By the author of "Etidorhpa" (John Uri Lloyd). Richard G. Badger & Co., Boston, 1897.

While this dainty volume has little in it bearing directly on pharmacy, still we are induced to notice it in these pages, not only on account of the distinct merit of the work, but also because of the author's well-known contributions on pharmaceutical subjects. That it will be read and enjoyed by pharmacists more than by any other class, we have little doubt. It is the second venture of the author in literature, and his transition from "Etidorhpa" to this is as startling as his first departure from scientific literature.

"The Right Side of the Car" is a short story of a ride across the Great American Desert on the Northern Pacific Railway, and of the approach to Mount Tacoma. The author will have none of the modern name, Mount Ranier after an obscure British admiral who never saw this continent; it does not compare with Tacoma, given to it by the Indians long before the British landed in America.

Two editions of this book have been issued, one a special author's souvenir edition, and the other for popular sale; the former will only be sent to those who have subscribed in advance. The profits of both will go to erect a monument to the late Professor John King.

PHARMACOPŒIA OF THE AMERICAN INSTITUTE OF HOMŒOPATHY. Published for the Committee on Pharmacopœia of the American Institute of Homœopathy. Otis Clapp & Son, agents, No. 10 Park Square, Boston, 1897.

In reviewing a work of this kind it is difficult to avoid drawing comparisons between the two branches of the medical profession, as well as between the two pharmacopœias representing those branches. It is the intention, however, to review this homœopathic pharmacopœia on its own merits and without unnecessary reference to other works in existence.

As long ago as 1868, the American Institute of Homœopathy, realizing the need of "a dispensatory which should embrace pharmacy," appointed a committee to prepare one. Reports of progress were made from time to time until 1888, when, owing to the death of the chairman some time previously, and the loss of the original manuscript, a new committee was appointed, consisting of twelve members, six to represent the profession of medicine and six to represent the profession of pharmacy.

The following quotation from the historical introduction is of interest, as it indicates the extent to which recognition is accorded homœopathic pharmacy.

It is earnestly hoped that each and every medical college will hereafter include in its curriculum, instruction in the principles and practice of pharmacy. The physician who dispenses medicine should at least be qualified to supplement the work of the professional pharmacist so thoroughly and accurately that his clinical reports will have a scientific value. Pharmaceutical knowledge seems to be even more important to the homœopathic than to allopathic practitioners, for the reason that only a portion of the former are within easy reach of the professional pharmacist who understands the preparation of medicines for homœopathic use.

The great bulk of the book of 674 pages is divided into three parts. Part I, of some 30 pages, is devoted to General Pharmacy, under which the following subjects are treated: Unit of Medicinal Strength, Menstrua, Drugs and Medicinal Substances, General Treatment of Drugs, Preparations from Drugs, Tinctures, Dilutions, Triturations, Medications, Prescriptions.

Part II is devoted to Special Pharmaceutics, and occupies some 545 pages. In this section the various medicinal substances are taken up in alphabetical order, and considered somewhat as they are in the U. S. Pharmacopœia, but in some respects rather more fully, which gives the book a resemblance to a dispensatory. For instance, the first article, *Abies Canadensis*, is treated under the following heads: Natural Order, Synonyms, Description, Habitat, History, Parts Used, Preparations. The last heading embraces the tincture and method of preparing it.

Acidum Aceticum and other chemical substances and compounds are treated under the following headings: Chemical Symbol, Synonyms, Description, Preparations. Many of the physiologically active metallic salts and alkaloids have the maximum dose given.

Part III consists of some 25 pages of Select Tables for Reference, many of which have been taken by permission from the U. S. Pharmacopœia; List of Medicines and Pronunciation, 15 pages, and Index of over 50 pages.

The Section in Part I, on General Pharmacy of Drugs for Homœopathic Use, is a concise statement of the processes used in, and the principles governing homœopathic pharmacy, and any well-educated pharmacist would be able to practise homœopathic pharmacy after a careful reading of this part. A section is devoted to cleanliness and cleaning of utensils, which contains directions concerning that which has been one of the reasons for the existence of homœopathy. Every school of pharmacy and medicine should keep the subject of cleanliness constantly before the students.

The first edition of a book having the scope of this one is sure to contain a number of errors, and a few of these may be pointed out.

The term "chemical symbol" is used throughout the book where in most cases "chemical formula" would be more in accordance with chemical nomenclature. In the German *säure*, the umlaut is in nearly every instance placed over the *u*, making *säure*. The sweeping statement is made that tannic acid "unites with all vegetable alkaloids, forming whitish precipitates," which will not hold true in the cases of morphine and caffeine. Petroleum ether and petroleum benzin are given as synonyms of nitrobenzol, which is away off from the truth, very misleading and liable to cause serious accidents.

In regard to the nomenclature in the book, it may be said to be a mixture of ancient and modern systems; for example, in accordance with the reform spelling movement, the final *e* is dropped from chloride, iodine and the alkaloids; consequently we have in this case *morphin acetate*, in which the *e* is dropped from morphine, where it is of use in distinguishing the alkaloid as a member of its class, while it is retained in the acetate, where it is of no apparent use.

We believe that this book has been compiled with a hope of removing the veil of mystery which apparently surrounds homœopathy, but the dismissal of a few substances like "Hahnemann's Causticum" would remove both book and school from the possible accusation of mysticism.

A TEXT-BOOK OF PRACTICAL THERAPEUTICS, with special reference to the application of remedial measures to disease and their employment upon a rational basis. By Hobart Amory Hare, M.D., B.Sc., Professor of Therapeutics and Materia Medica in the Jefferson Medical College of Philadelphia. Philadelphia: Lea Bros. & Co. 8vo, Pp. 758. Sixth edition.

The fourth edition of this valuable and practical work was noticed in the

AMERICAN JOURNAL OF PHARMACY, 1894, p. 494, and the good opinion then expressed about it has been strengthened by a more intimate acquaintance with it. We think that every pharmacist of the country would find it of advantage to give it a place in his library.

An article of special interest is that on the Thyroid Gland, which is being so extensively employed at the present time in treating myxœdema and cretinism; the statements made coincide with some of the experience of the writer.

The statement that "Pilocarpine is so good a myotic as to be rapidly supplanting eserine (physostigmine) for this purpose with some clinicians," will be new to many.

The book is abreast of the day in treating of the newer remedies, such as Eucaine Hydrochlorate (the synthetic substitute for cocaine), Formaldehyde, Nuclein, Thiosinamine and Thymus Gland.

The article upon Diphtheria is a most interesting and valuable one. Professor Hare is strongly in favor of the antitoxin treatment.

It is probably an omission that in the article on *Nux Vomica* no reference is made to the use of strychnine nitrate in the treatment of acute alcoholism.

C. B. L.

YEAR-BOOK OF PHARMACY. Comprising abstracts of papers relating to pharmacy, materia medica and chemistry, contributed to British and Foreign journals, from July 1, 1896, to June 30, 1897, with the transactions of the British Pharmaceutical Conference, at the thirty-fourth annual meeting, held at Glasgow, August, 1897. J. & A. Churchill. London. 1897.

The foregoing title sufficiently explains the scope of the Year-Book, and it only remains to be said that this year's volume is fully up to the standard of its predecessors. Its compactness is a valuable feature, which is obtained by the elimination of all unnecessary matter.

CONTRIBUTIONS FROM THE BOTANICAL LABORATORY OF THE UNIVERSITY OF PENNSYLVANIA. Philadelphia. 1897.

This is the third and last number of Volume I, and contains the index to the volume. The first number was issued in 1892. The present number consists of about 160 pages of text and nineteen plates. The following subjects are considered: "A Chemico-Physiological Study of *Spirogyra nitida*," by Mary E. Pennington, Ph.D.; "On the Structure and Pollination of the Flowers of *Eupatorium ageratoides* and *Eupatorium cœlestinum*," by Laura B. Cross, Ph.D.; "Contributions to the Life-History of *Amphicarpæa monoica*," by Adeline F. Schively, Ph.D. All of these give abundant evidence of creditable research work.

L'AZOTE ET LE VÉGÉTATION FORESTIÈRE. Par E. Henry, Chargé de Cours à l'École Forestière. Pp. 23. Nancy, France. 1897.

ON THE MECHANISMS IN CERTAIN LAMELLIBRANCH BORING MOLLUSCS. By Francis Ernest Lloyd. Pp. 17 and two plates. Reprinted from *Transactions New York Academy of Science*, August, 1897.

SEMI-ANNUAL REPORT OF SCHIMMEL & CO. Leipzig and New York. October, 1897.

The novelties prepared and studied during the past six months were: Savory

oil, from *Satureja hortensis*, L.; mountain savory oil, from *Satureja montana*, L.; balsam tansy oil, from *Tanacetum balsamita*, L.; and *Xanthorrhoea* gum oil, from *Xanthorrhoea hastilis*, R. B.; and some other species. There is also much other information of value in the 88 pages that make up the pamphlet.

INDEX-CATALOGUE OF THE LIBRARY OF THE SURGEON-GENERAL'S OFFICE, U. S. ARMY. Second Series. Vol. II. B to Bywater. Government Printing-Office. Washington. 1897.

MINUTES OF THE PHARMACEUTICAL MEETING.

PHILADELPHIA, November 16, 1897.

The regular Pharmaceutical Meeting was held at 3 P.M., with J. W. England in the chair.

The minutes of the last meeting were allowed to stand as published.

Dr. John W. Harshberger, of the University of Pennsylvania, favored the audience with an address on the "Vegetation of the Yellowstone Hot Springs," which was not only highly scientific, but at the same time replete with vivid descriptions of the numerous phenomena which delight the naturalist in our National Park in Wyoming.

In closing, the speaker fittingly indulged in speculation concerning the origin of life on the earth, and asked the question whether the facts he had presented did not point to hot springs as the origin of primeval organisms.

In replying to a query as to the medicinal virtues of the water of the hot springs, Dr. Harshberger said that he believed they were attributed to the inorganic constituents.

The chairman remarked that he had been of the opinion for some time that the efficacy of many of the so-called medicinal waters depends more upon their purity than upon the amount of mineral salts, inasmuch as these are present in very small proportion.

Dr. C. B. Lowe coincided with this view and attributed their usefulness to a mechanical action rather than to any intrinsic qualities.

Charles H. LaWall communicated some analytical data which he had obtained during the year, in a paper entitled "Laboratory Notes."

Replying to a question concerning the use of Japan wax, Mr. LaWall said that it is used in the laundry business and also for making pomades.

Prof. Henry Trimble presented a paper on "Pomegranate Rind." In commenting upon the quantity of tannin present in this substance, he said that 40 per cent. had been reported in the wild variety. A number of the Spanish fruits were exhibited, and those who had never eaten of them were given an opportunity of testing the merits thereof.

Dr. Harshberger remarked that in Mexico the pulp of this fruit is used for giving a red color to different kinds of drinks.

Having recently been engaged in an examination of willow oak (*Quercus Phellos*), Prof. Trimble called attention to the leaves and acorns of this plant, and also to the leaves of *Quercus imbricaria*, to show the difference in appearance of these two species. In the course of his remarks, he alluded to the interest which Prof. Procter had taken in *Quercus heterophylla*, Bartram's oak, some thirty-odd years ago.

Some cabinet specimens were presented as follows :

Samples of monobromated camphor and salol by Mr. LaWall, and a handsome specimen of metallic bismuth by Mr. Harry B. French.

On motion, the meeting adjourned.

T. S. WIEGAND,
Registrar.

NOTES AND NEWS.

Formaldehyde may, in the near future, become of considerable industrial value in addition to the use it already has in medicine. Prof. C. S. Dolley has recently secured a patent for its use in the manufacture of leather. Hides or skins, prepared in the usual way for tanning, are subjected to the action of formaldehyde of a strength gradually increasing from 3 to 10 per cent. About one hour's treatment completes the process. Or the hides are exposed in a closed chamber to gaseous formaldehyde, either by itself or in conjunction with aqueous or alcoholic vapors.

The Plant World is a new monthly journal of popular botany. The first number was issued October 1st, and contains papers on "The Sword Moss," by Elizabeth G. Britton; "The Families of Flowering Plants," by Charles Louis Pollard; "Sensitiveness of the Sundew," by F. H. Knowlton; "Ferns of the Yosemite and the Neighboring Sierras," by S. H. Burnham; "Some Sand-Barren Plants," by Willard N. Clute; Editorials, Notes and News. F. H. Knowlton, Ph.D., of the U. S. National Museum, Washington, D. C., is editor-in-chief, assisted by six associate editors, all well-known writers on botanical subjects. Willard N. Clute & Co., Binghamton, N. Y., are the publishers.

OBITUARY.

Prof. Dr. L. A. Buchner, who, during a long and honorable career, was identified with the sciences of medicine and pharmacy, died at Munich, October 23d, in the eighty-fifth year of his age.

He was the son of Prof. Johann Andreas Buchner, the founder of scientific pharmacy in Germany, and naturally followed in the footsteps of his distinguished father. He served his apprenticeship in Nürnberg, after which he studied in Munich, Paris and Giessen. In 1839 he received the *dégré* of Doctor of Philosophy, and in 1842 graduated in medicine. Later became a member of the Medical Faculty of the University of Munich, and in 1852 was named Professor of Pharmacy and Conservator of the Pharmaceutical Institute. In 1871 Buchner was appointed a member of the Berlin Commission for composing the German Pharmacopœia, on which he wrote a very complete commentary. In addition to much other literary work he was, after his father's death, editor of the *Repertorium für Pharmacie* for twenty-five years.

The deceased was highly esteemed by his associates, and his kindly interest in the welfare of his students earned for him the title of "Vater Buchner." He was the possessor of several honorary titles, and was a corresponding member of the Philadelphia College of Pharmacy.

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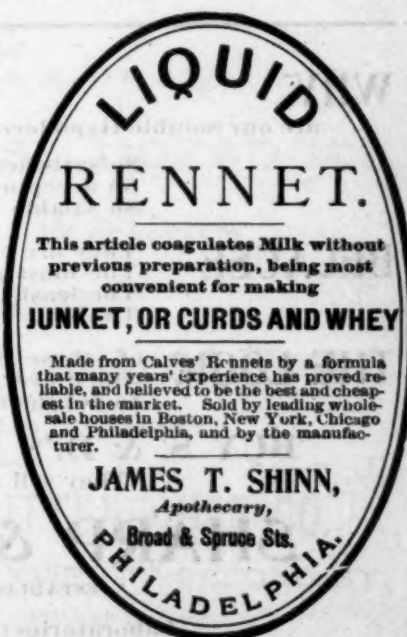
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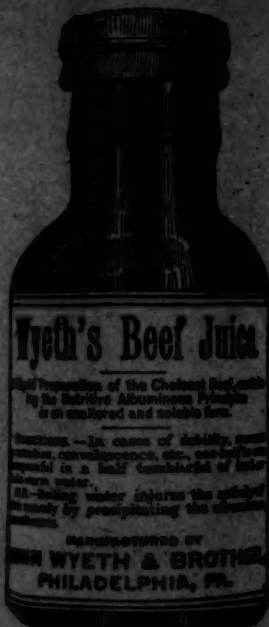
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